CLAIMS

What is claimed is:

1. A contactless sheet resistance measurement apparatus for measuring sheet resistance comprising:

     5   means for illuminating the area of semiconductor structure with intensity modulated light;

            means for detecting SPV signals inside and outside said illumination area optically coupled to said illuminating means; and

            means for measurement of said SPV signals inside and outside the

    10   illumination area connected to said means for detecting SPV signals.

2. A contactless sheet resistance measurement apparatus for measuring the sheet resistance of claim 1, wherein said illumination means comprises a light emitting diode with a driver forming the sinusoidal illumination and an optical fiber directing the light onto the wafer surface.

15   3. A contactless sheet resistance measurement apparatus for measuring the sheet resistance of claim 1, wherein said means for detecting of SPV signals comprises a transparent conducting electrode optically coupled with a light source used for detecting SPV signal inside the illumination area and a non transparent electrode used for detecting SPV signal outside the illumination area.

20   4. A contactless sheet resistance measurement apparatus for measuring the sheet resistance of claim 3, wherein said transparent conducting electrode is a glass or quartz disk with ITO coating and the non transparent electrode is metal ring coaxially installed to said glass or quartz disk.

5. A contactless sheet resistance measurement apparatus for measuring the sheet resistance of claim 3, wherein said transparent and conducting electrode is a glass or quartz disk with an ITO coating and the non transparent electrode is a part of the metal ring coaxially installed to said glass disk.

6. A contactless sheet resistance measurement method, comprising the steps of:

illumination of the area of the semiconductor structure with known sheet resistance through a transparent electrode with intensity modulated light;

measurement of the SPV signal from the transparent electrode;

adjustment of the light flux to obtain linear dependence of the SPV signal versus light flux;

measurement of SPV signals $Vs0$;

measurement of SPV signal $Vs1$ at the same conditions for wafer with unknown Rs; and

determination of the sheet resistance using measured $RATIO=Vs1/Vs0$, and the calculated curve or table $RATIO(Rs)$.

7. A contactless sheet resistance measurement method, comprising the steps of:

illumination the area of the semiconductor structure through a transparent electrode with intensity modulated light at maximum frequency corresponding to bandwidth of SPV preamplifier and lock-in amplifier;

measurement of the SPV signal, $Vs1$, from the transparent electrode;

adjustment of the light flux to get linear dependence of the SPV signal, $Vs1$, versus light flux;

measurement of SPV signals, *Vs1* and *Vs2*;

adjustment of light modulating frequency to get the ratio of SPV signals *RATIO=Vs1/Vs2<5* and measurement of *Vs1* an*Vs2* at this frequency; and

determination of the sheet resistance using measured *RATIO=Vs1/Vs2*, and

5   the calculated curve or table *RATIO(Rs)*.

8. A contactless method for measuring of sheet resistance and conductance of a p-n junction, comprising the steps of:

illumination the area of the semiconductor structure through a transparent electrode with intensity modulated light at maximum frequency, *F*,

10   corresponding to a bandwidth of SPV preamplifier and lock-in amplifier;

measurement of the SPV signal, *Vs1*, from transparent electrode;

adjustment of the light flux to get linear dependence of the SPV signal, *Vs1*, versus light flux;

measurement of SPV signals and its phase shifts, *Vs1,Θ1* and *Vs2,Θ2* from

15   transparent and non transparent electrodes;

decreasing of light modulating frequency to get the ratio of SPV signals *RATIO=Vs1/Vs2<5* and measurement of *Vs1,Θ1* and *Vs2,Θ2* at this frequency; and

determination of the sheet resistance Rs and junction conductance Gs using

20   measured SPV signals, its phase shifts, *Vs1,Θ1* and *Vs2,Θ2* and a set of equations:

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$$\frac{Vs1}{Vs2} = \left| \frac{V_{S1}}{V_{S2}} \right| = \left| \frac{1}{2} kR_0^2 \frac{K_1(kR_0)I_0(kR_0) + K_0(kR_0)I_1(kR_0) - (1/2kR_0)K_1(kR_0)I_1(kR_0)}{I_1(kR_0)[R_1 \cdot K_1(kR_1) - R_2K_1(kR_2)]} \right| \quad (11)$$

$$\theta_1 - \theta_2 = Arg\left[\frac{1}{2} kR_0^2 \frac{K_1(kR_0)I_0(kR_0) + K_0(kR_0)I_1(kR_0) - (1/2kR_0)K_1(kR_0)I_1(kR_0)}{I_1(kR_0)[R_1 \cdot K_1(kR_1) - R_2K_1(kR_2)]} \right] \quad (12).$$